Draft Surface Storage Option Technical Memorandum

Big Dry Creek Reservoir Modification

Prepared for

U.S. Bureau of Reclamation
Mid Pacific Region

By

MWH
MONTGOMERY WATSON HARZA

in Cooperation with
California Department of Water Resources

March 2003

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UPPER SAN JOAQUIN RIVER BASIN STORAGE INVESTIGATION

TABLE OF CONTENTS

Section **Page**

EXECUTIVE SUMMARY ES-1

CHAPTER 1. INTRODUCTION 1-1

PROJECT DESCRIPTION 1-1
EXISTING FACILITIES 1-1
SUMMARY OF PREVIOUS INVESTIGATIONS 1-4
PROPOSED IMPROVEMENTS 1-4
APPROACH AND METHODOLOGY 1-5

CHAPTER 2. TOPOGRAPHIC SETTING 2-1

TOPOGRAPHY 2-1
AVAILABLE TOPOGRAPHIC MAPPING 2-1
AVAILABLE AERIAL PHOTOGRAPHY 2-1

CHAPTER 3. GEOLOGIC AND SEISMIC SETTING 3-1

REGIONAL GEOLOGY AND SEISMICITY 3-1
SITE GEOLOGY AND FAULTING 3-1
SITE GEOTECHNICAL CONDITIONS 3-2

CHAPTER 4. HYDROLOGIC SETTING 4-1

DRAINAGE AREA 4-1
RAINFALL 4-1
EROSION, RUNOFF, AND RECHARGE 4-1
AVAILABLE FLOOD DATA 4-1

CHAPTER 5. ENVIRONMENTAL SETTING 5-1

INTRODUCTION 5-1
BOTANY 5-1
Overview of Existing Conditions 5-1
Constraints 5-2
Opportunities 5-2
WILDLIFE 5-2

Overview of Existing Conditions 5-2
Constraints 5-2
Opportunities 5-2
AQUATIC BIOLOGY/WATER QUALITY 5-2
Overview of Existing Conditions 5-2
Constraints 5-3
Opportunities 5-3
RECREATION 5-3
Overview of Existing Conditions 5-3
Constraints 5-3
Opportunities 5-3
CULTURAL RESOURCES 5-3
Overview of Existing Conditions 5-3
Constraints 5-4
Opportunities 5-4
LAND USE 5-4
Overview of Existing Conditions 5-4
Constraints 5-4
Opportunities 5-5
MINING AND OTHER PAST ACTIVITIES 5-5
Overview of Existing Conditions 5-5
Constraints 5-5
HAZARDOUS AND TOXIC MATERIALS 5-5
Overview of Existing Conditions 5-5
Constraints 5-5

CHAPTER 6. STORAGE STRUCTURES AND APPURTENANT FEATURES 6-1

EMBANKMENTS 6-1
RESERVOIR AREA/ELEVATION/CAPACITY CURVES 6-1
CONSTRUCTABILITY 6-1
Land, Right-of-Way, Access, and Easements 6-1
Borrow Sources/Materials 6-2
Foundations 6-2
Power Sources 6-2
Staging and Lay Down Area 6-2
Contractor Availability and Resources 6-2
Construction Schedule and Seasonal Constraints 6-2
Flood Routing During Construction 6-2
Environmental Impacts During Construction 6-2
Permits 6-3
APPURTENANT FEATURES 6-4
CONVEYANCE 6-4
Pumping Plants 6-4
COSTS 6-4
Initial Construction Costs 6-4
Operations and Maintenance Costs 6-5
SYSTEMS OPERATIONS 6-5

CHAPTER 7. HYDROELECTRIC POWER OPTIONS 7-1

PUMPED STORAGE CONSIDERATIONS 7-1
ADDED HYDROELECTRIC POWER TO EXISTING STRUCTURES 7-1
NEW HYDROELECTRIC POWER 7-1
TRANSMISSION AND DISTRIBUTION 7-1

CHAPTER 8. REFERENCES 8-1

LIST OF FIGURES

Figure 1-1 Big Dry Creek Reservoir Location Map 1-2
Figure 1-2 Big Dry Creek Dam and Reservoir 1-3
Figure 1-3 Potential Modifications to Existing Facility 1-6
Figure 6-1 Elevation vs Storage Curve 6-1

LIST OF APPENDICES

Appendix A Engineering Field Trip Report
Appendix B Environmental Field Trip Report
Appendix C Cost Estimate

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EXECUTIVE SUMMARY

An appraisal-level study of potential modifications at Big Dry Creek Dam and Reservoir to facilitate increased water storage was completed as part of the Upper San Joaquin River Basin Storage Investigation (Investigation). The Investigation is being completed by the U.S. Bureau of Reclamation - Mid-Pacific Region, in cooperation with the California Department of Water Resources, consistent with recommendations in the CALFED Bay Delta Program Record of Decision, August 2000.

Big Dry Creek Dam and Reservoir are flood detention facilities located on Dry Creek in Fresno County, near Clovis. The dam and reservoir also span smaller drainages to the north of Dry Creek. The facilities were constructed in 1948 by the U.S. Army Corps of Engineers, turned over to the California State Reclamation Board, and finally transferred to Fresno County. They are currently operated by the Fresno Metropolitan Flood Control District (FMFCD), which makes controlled releases of flood runoff to downstream infiltration basins. The Friant-Kern Canal passes within a mile of the reservoir, to the northeast.

Big Dry Creek Reservoir has not been approved for long-term water storage. Volumetrically, it could store 30,000 acre-feet of water. However, it is operationally limited to storing no more than 10,000 acre-feet for 90 days, conditional upon passing performance tests. Testing of the existing facility for flood storage capability is not complete. For this reason, it is uncertain what structural modifications would be required to enable the reservoir to store water for more than 90 days and thereby more fully utilize its volumetric capacity. Consequently, this Technical Memorandum focuses on improvements that would allow the reservoir to be used more frequently for temporary storage of up to 10,000 acre-feet.

Proposed modifications include installation of a turnout from the Friant-Kern Canal, along with an energy dissipater and channel armor. Total first cost is estimated at $1.1 million.

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CHAPTER 1. INTRODUCTION

The U.S. Bureau of Reclamation (Reclamation), in cooperation with the California Department of Water Resources (DWR), is completing the Upper San Joaquin River Basin Storage Investigation (Investigation) consistent with the CALFED Bay Delta Program Record of Decision (ROD), August 2000. The Investigation will consider opportunities to develop water supplies to contribute to water quality improvements in and restoration of the San Joaquin River and to enhance conjunctive management and exchanges to provide high quality water to urban areas. The ROD indicated that the Investigation should consider enlargement of Friant Dam or development of an equivalent storage program to meet Investigation objectives.

The Investigation identified several potential surface storage sites to be initially considered through appraisal-level studies of engineering and environmental issues. This document presents findings from an appraisal-level review of potential modifications to the Big Dry Creek flood detention dam and basin.

PROJECT DESCRIPTION

Big Dry Creek Dam and Reservoir are flood control facilities located on Dry Creek in Fresno County, near the community of Clovis, about 15 miles northeast of Fresno (Figure 1-1). The dam and reservoir also span smaller drainages immediately to the north of Dry Creek. Downstream of the dam, Dry Creek continues on to the southwest, passing through Fresno, for a distance of about 18 miles before it becomes the Dry Creek Canal, which services areas to the southwest of Fresno (Figure 2).

The facilities are operated by the Fresno Metropolitan Flood Control District (FMFCD), which makes controlled releases of flood runoff to downstream infiltration basins. This Technical Memorandum focuses on improvements that would allow the reservoir to be used more frequently for temporary storage of up to 10,000 acre-feet.

EXISTING FACILITIES

Big Dry Creek Dam was constructed 1948 by the U.S. Army Corps of Engineers (the Corps), turned over to the California State Reclamation Board, and finally transferred to Fresno County. It is currently owned and operated by the Fresno Metropolitan Flood Control District (FMFCD). The district operates the project to make beneficial use of flood runoff by controlled releases to infiltration basins. Dry Creek passes through, for a distance of about 18 miles, before it becomes contained by the Dry Creek Canal, which serves areas to the southwest of Fresno.

Big Dry Creek Dam was originally constructed with a crest at elevation 435 feet above mean sea level (elevation 435) and a gross pool storage capacity of 16,500 acre-feet. In 1993, the dam crest was raised to elevation 442.2 and the reservoir's storage capacity was increased to 30,200 acre-feet at a gross pool elevation of 432.7 feet.

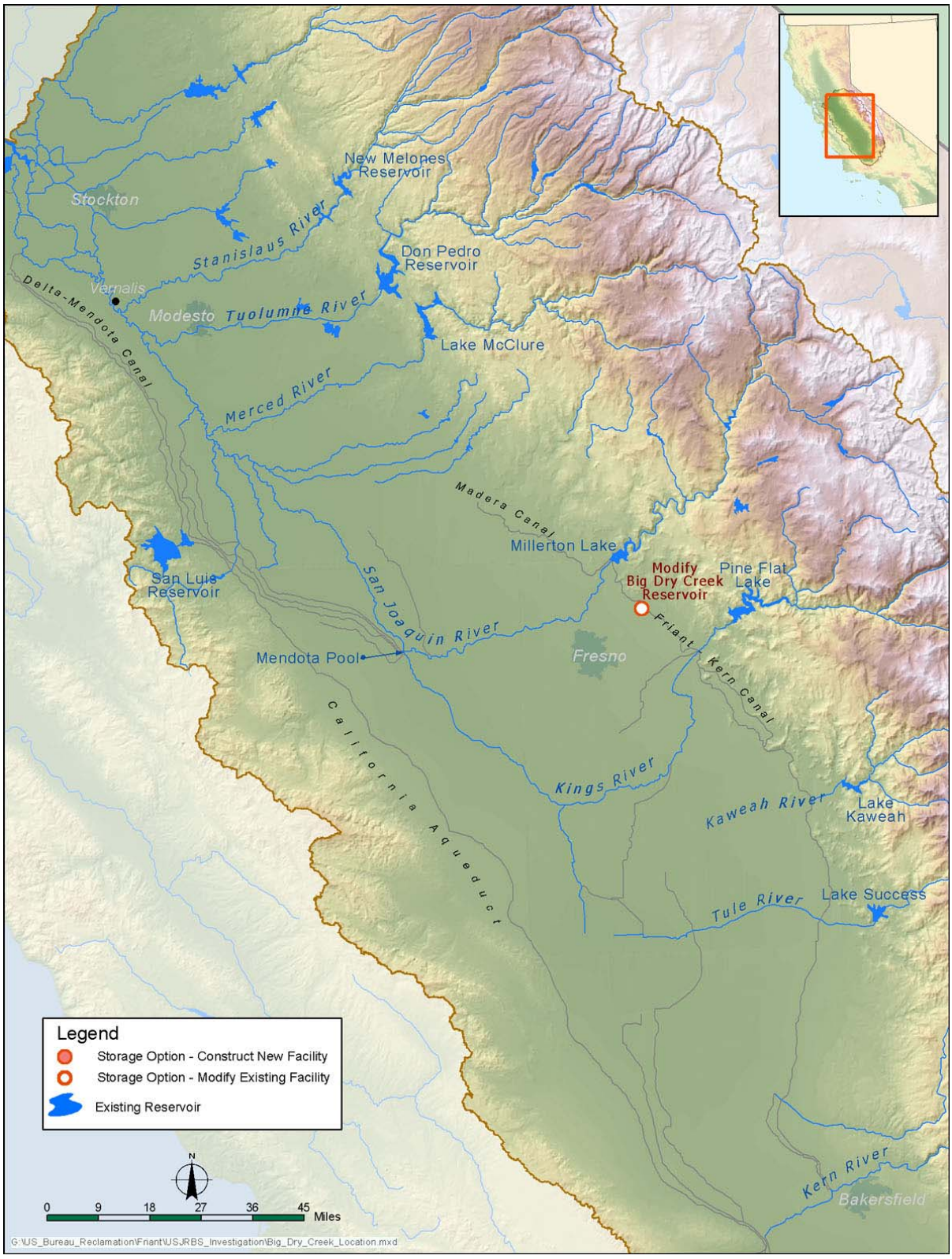

FIGURE 1-1. BIG DRY CREEK RESERVOIR LOCATION MAP

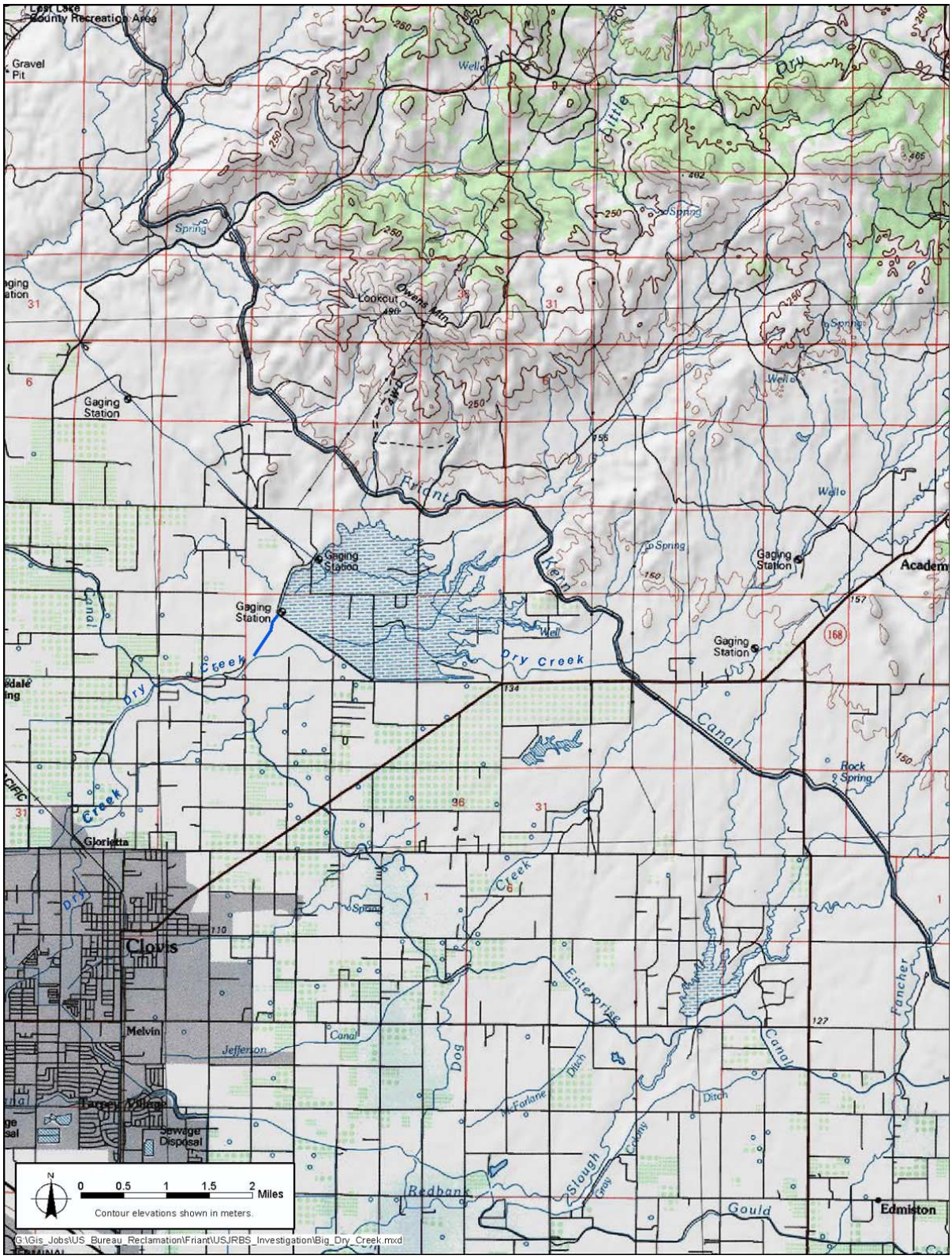

FIGURE 1-2. BIG DRY CREEK DAM AND RESERVOIR

The dam is a homogeneous rolled earth fill type structure with a crest length of about 25,300 feet. The upstream slope of the embankment from the toe to elevation 438.5 is 3:1 (horizontal to vertical) and from elevation 438.5 to the crest is 2:1. The downstream slope of the embankment from the toe to elevation 438.5 is 2.25:1 and from elevation 438.5 to the crest is 2:1.

Controlled releases of detained flood flows are made through two low-level release structures to Big and Little Dry Creeks. An ungated, 500-foot wide concrete ogee spillway at elevation 432.7 directs uncontrolled flood flows to the San Joaquin River via the Little Dry Creek Diversion Channel.

In a 1995 tripartite meeting of FMFCD, the Corps, and DWR Division of Safety of Dams (DSOD), DSOD stated that 10,000 acre-feet of water, which fills the reservoir to 50 percent of the dam height, could be stored between April and September for a time limit not to exceed 90 days. The DSOD stipulation, however, required that FMFCD first demonstrate that the embankment could perform satisfactorily when the reservoir was filled to 25 percent of the dam height, and then if excessive seepage was not observed, conduct a similar test at 50 percent of the embankment height.

The 25 percent level test was accomplished without significant seepage problems. FMFCD has not had the opportunity to perform a 50 percent test requirement because of lack of water. FMFCD has indicated that a temporary turn out from the Friant-Kern Canal could provide sufficient water to accomplish the 50 percent level test. If the embankment cannot hold the 50 percent level without seepage or other problems, reinforcement and seepage control of foundations and the embankment would be needed, at a minimum.

The City of Fresno has water rights to 60,000 acre-feet of water from the San Joaquin River through a Senate Bill passed in 1986. The authorization indicates that the City of Fresno can use the water for groundwater recharge. Accordingly, FMFCD has built multi-use detention basins around Fresno to use for infiltration of this water.

SUMMARY OF PREVIOUS INVESTIGATIONS

Several Investigations of Big Dry Creek Dam have been completed previously. The first was the initial investigation in the late 1940s by the Corps. That investigation led to construction of Big Dry Creek Dam in 1948.

In 1986, the Corps released Design Memorandum No. 1, Redbank and Fancher Creeks, California, General Design.

In 1990, the Corps released Design Memorandum No. 2, Redbank and Fancher Creeks, California, Big Dry Creek Dam Feature Design. This document preceded the raise of the dam to its present height.

PROPOSED IMPROVEMENTS

Since dam safety concerns leave in doubt whether the existing structure could accommodate storage of water for periods greater than 30 days, this Technical Memorandum focuses on improvements that would enable more frequent temporary storage of up to 10,000 acre-feet.

Proposed modifications to the existing facility include a gravity turnout from the Friant-Kern Canal and an energy dissipater. The Friant-Kern Canal lies immediately to the northeast of Big Dry Creek Reservoir and siphons under Dry Creek about ½-mile north of the State Route 168 canal crossing. The proposed turnout would be located at the point where the canal is siphoned under Dry Creek (Figure 1-3). A turnout capacity rate of 400 cfs would allow Big Dry Creek Reservoir to be filled the DSOD proposed maximum 10,000 acre-feet storage level in a two-week period. The dam would not be raised.

These proposed facilities would also be required if performance testing results were to indicate that long term storage of water could become an option.

APPROACH AND METHODOLOGY

This Technical Memorandum (TM) was prepared from a brief review of the documents listed above, an engineering field reconnaissance of the dam and reservoir conducted on June 13, 2002 (Appendix A), and an environmental field reconnaissance conducted on May 30, 2002 (Appendix B).

During the June 2002 field trip, engineers and geologists examined the site. Locations of existing and proposed structures were visually assessed. Topography, geology, geotechnical conditions, and utilities were noted. Access routes were considered, as well as possible staging and laydown areas.

During the May 2002 environmental field visit, specialists in botany, wildlife, aquatic biology, recreational resources, and cultural resources visually assessed existing environmental resources. Additional research was conducted, making use of prior studies and available literature, the California Natural Diversity Database, and topographic maps. This information was used to preliminarily identify the extent to which potential environmental impacts might constrain the storage options under consideration. Where evident and relevant, opportunities for improving environmental resources or mitigating adverse effects were also noted. Surveys were not conducted and consultations with external resource management or environmental agencies were not held.

The seismotectonic evaluation conducted by Reclamation for this study was based on readily available information considered appropriate for appraisal-level studies only. Detailed, site-specific seismotectonic investigations have not been conducted. Aerial/remotely-sensed imagery were not evaluated. More detailed, site-specific studies would be required for higher-level designs.

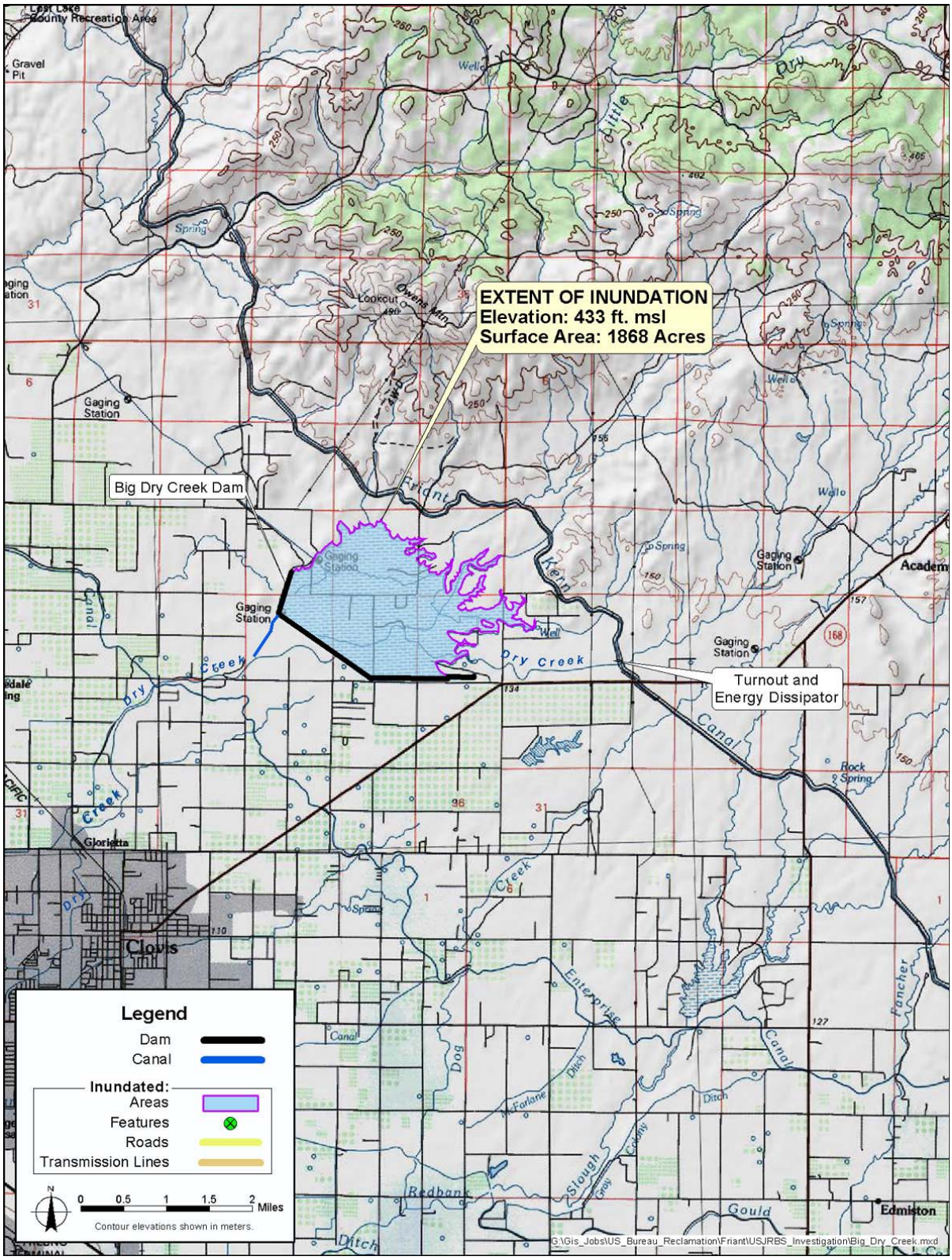

FIGURE 1-3. POTENTIAL MODIFICATIONS TO EXISTING FACILITY

CHAPTER 2. TOPOGRAPHIC SETTING

TOPOGRAPHY

The damsite is located in low rolling hills on the margin of the San Joaquin Valley. Regional topography is that of a nearly level floor of the San Joaquin Valley rising abruptly to moderately steep, northwest-trending foothills with rounded canyons. Dry Creek is a southwest- to west-flowing stream that drains a broad, gently sloping basin before the Sierra Nevada foothills.

Elevations in the immediate area of the damsite range from about elevation 400 to around elevation 460. Farther north and east, the land surface sharply steepens to the foothills of the Sierra Nevada mountain range. Shallow west to southwest draining stream valleys have been cut into the rolling terrain. Two rivers dominate the area, the San Joaquin River (about 7 miles northwest) and the Kings River (about 13 miles southeast).

The damsite is located across a broad area of low rolling hills. The left abutment blends with the gently rising topography east of the main dam section. The right abutment ties into low hills north of the main dam section. The streambed axis at the downstream face of the dam is about elevation 400

AVAILABLE TOPOGRAPHIC MAPPING

Topographic mapping other than that available from the U. S. Geological Survey (USGS) appears to have been used by the Corps and would probably be available from them if additional detailed study is desired. FMFCD should also be in possession of topographic mapping.

AVAILABLE AERIAL PHOTOGRAPHY

Aerial photography of various scales and imagery is available from USGS archive files. Additional aerial imagery may also be available from the U.S. Department of Agriculture, Reclamation, and the Corps. FMFCD may also be in possession of site aerial photography. A specific search of the available photography was not conducted for this Technical Memorandum nor was any aerial photography reviewed.

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CHAPTER 3. GEOLOGIC AND SEISMIC SETTING

REGIONAL GEOLOGY AND SEISMICITY

The Big Dry Creek Dam and Reservoir project area is located in an area that traverses the contact between alluvial deposits of the San Joaquin Valley portion of the Great Valley Geomorphic Province and the Sierra Nevada Geomorphic Province. The Great Valley basin is filled with thick accumulations of marine (at depth) and non-marine sediments shed largely from the Sierra Nevada mountain range. Recent alluvium of lake and river origin blankets most of the present-day surface, while dissected remnants of Pleistocene alluvial fans rim the valley margin.

The Sierra Nevada range is characterized by batholiths of Mesozoic granitic rock and Paleozoic roof pendants of the Calaveras Complex and related rocks. The Sierra Nevada foothills take the form of outliers of low to irregular hills of Mesozoic granitic and late Paleozoic to Mesozoic basic and ultrabasic rock (ophiolites), as well as other associated Mesozoic metamorphic rocks.

Overall, seismic hazard potential at the site is low. Preliminary earthquake loading analysis, for this appraisal-level evaluation, considered two types of potential earthquake sources: fault sources and areal/background sources.

Twenty-two potential fault sources for the project site were identified. These included those associated with the San Andreas fault, seven western Great Valley faults, seven eastern Sierra Nevada faults, the White Wolf fault of the southern San Joaquin Valley, and six faults of the Sierra Nevada Foothills fault system. No major through going or shear zones have been identified in this area of the Sierra Nevada range and historic seismicity rates are low.

The areal/background seismic source considered was the South Sierran Source Block (SSSB), the region surrounding the project site. This region possesses relatively uniform seismotectonic characteristics.

Probabilistic seismic hazard analysis shows that the peak horizontal accelerations to be expected at the site are 0.13g with a 2,500-year return period, 0.17g with a 5,000-year return period, and 0.23g with a 10,000-year return period.

SITE GEOLOGY AND FAULTING

The material in the area consists of bedrock to alluvial formations, residual soil, and recent streambed material. The project area lies within Seismic Zone 3.

Geologic units at the damsite and reservoir area range in age from Mesozoic bedrock units to recent stream deposits. The bedrock units are deeply weathered pre-Cretaceous meta-sedimentary and meta-volcanic rocks and Mesozoic granitics. The metamorphic units are essentially roof pendants to the granitic batholiths of the Sierra Nevada range. Weathered bedrock directly underlies the western, northern, and northeastern portion of the reservoir area.

Pleistocene sediments of the Riverbank formation underlie the eastern and southern reservoir areas. The Riverbank unit consists of locally derived alluvial silt and sand.

The Recent Modesto formation occupies the area under the southwestern portion of the reservoir area. This alluvial fan unit is a locally derived deposit of alluvial silt, sand, and gravel.

A buried fault identified as the Clovis fault passes beneath the reservoir area, but it is not considered significant.

SITE GEOTECHNICAL CONDITIONS

From the types of geologic units mapped in the Big Dry Creek Dam and Reservoir site, only the bedrock units under the northern portion of the reservoir area may be considered indurated, and the near surface bedrock is likely deeply weathered. The rest of the geologic units mapped in the area all appear to be unconsolidated and are likely to be very permeable.

CHAPTER 4. HYDROLOGIC SETTING

DRAINAGE AREA

The drainage area for the Big Dry Creek Reservoir includes the drainages of two primary streams, Dry Creek and Dog Creek. Their combined drainage area is about 82 square miles. Elevations within the Dry Creek watershed range from roughly elevation 400 at the downstream outlet of Big Dry Creek Dam, to about elevation 1,500 at the headwaters.

RAINFALL

Rainfall in this Mediterranean climate region varies from about 6 inches per year in the valley to about 50 inches per year in the Sierra Nevada range. Normal annual precipitation over the general Dry Creek basin area varies from 10.5 inches east of Fresno to over 30 inches in the headwaters.

About 90 percent of the rainfall in the region occurs during November through April. Below about elevation 5,000, precipitation typically occurs as rain, while above that, as snow. However, warm winter storms may produce rain up as high as elevation 11,000, and exceptionally cold fronts may drop snow on the valley floor.

EROSION, RUNOFF, AND RECHARGE

Sheet and gully erosion affect the foothills and mountains of the San Joaquin Basin quite extensively. However, the foothills east of Fresno are considered well-managed grazing land and experience far less erosion problems than other San Joaquin Valley foothills.

The Big Dry Creek project is designed to provide Standard Project Flood (SPF) protection to the Fresno-Clovis area. Current flood operation procedures direct most floodwater (up to 700 cfs) to the San Joaquin River through the Little Dry Creek low-level release facility to the Little Dry Creek Flood Channel.

As currently designed, if reservoir storage were to exceed 30,200 acre-feet (elevation 432.7), excess floodwater would spill from the reservoir through an ungated spillway to the flood channel. As a flood event recedes, releases are made through the Big Dry Creek release facility (up to 150 cfs). When possible, these releases are distributed through the available detention basins in the FMFCD system, throughout the City of Fresno, to assist in recharging the ground water basin.

AVAILABLE FLOOD DATA

Big Dry Creek Reservoir has a capacity of 30,200 acre-feet. However, the reservoir has never been filled to a level greater than 15,000 acre-feet during any flood event.

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CHAPTER 5. ENVIRONMENTAL SETTING

The environmental setting descriptions provided in this section pertain to the area within the inundation of the potential project area. For Big Dry Creek Dam, this description addresses the existing reservoir pool area.

INTRODUCTION

This chapter describes existing environmental resources at the site and qualitatively describes potential effects of reservoir modification, indicating the extent to which expected or potential environmental effects might pose a constraint to the storage options being considered. Where evident, opportunities for improving environmental resources or for mitigating any adverse effects have been noted. The analysis concentrated on botany, terrestrial wildlife, aquatic biology, recreational resources, cultural resources, and existing land uses. Mining and other known past activities that might affect site conditions are also briefly discussed, along with the potential presence of hazardous or toxic materials. Temporary construction related disruptions and impacts are discussed in Chapter 6.

The identification of constraints was conducted at a preliminary, appraisal level of planning, consistent with the current phase of the Investigation. Criteria considered were based, in part, upon criteria commonly used to evaluate environmental impacts of projects under the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The application of criteria that may be used for NEPA or CEQA evaluation does not imply that the analysis is at a level that would be needed for an Environmental Impact Statement or Environmental Impact Report. Considerations included: presence of special status species (e.g. species listed as endangered or threatened), species of concern, or sensitive habitats; relative amounts of affected riparian or wetland habitat; effects on native or game fish; conflict with established recreational uses or land uses; presence of nationally registered historic places, sacred Native American sites, or traditional cultural properties; permanent disruption or division of established communities; and loss of energy production facilities.

BOTANY

Overview of Existing Conditions

Annual grassland habitats and some riparian habitat vegetation are present. There are also wetlands from the current residual pool. Vernal pools could be present as well.

Eight special-status species are known to occur in the region around the Big Dry Creek flood control reservoir: Hartweg's pseudobahia, Tulare pseudobahia, San Joaquin Valley Orcutt grass, Greene's tuctoria, succulent owl's-clover, Sanford's arrowhead, spiny-sepaled button-celery, and Madera linanthus. The first five species have both state and federal status as rare, threatened, or endangered species. The remaining three species have California Native Plant Society (CNPS) List 1B status. Four of the eight species occur in vernal pools, and all but one of these is listed.

Constraints

Riparian habitat constraints would be minimal. The biggest constraint would be vernal pools with one or more listed species. The California Natural Diversity Data Base (CNDDB) does not report any special-status species in the area of the existing flood control reservoir, but surveys may be required to determine whether any species are in fact present.

Opportunities

The creation of wetland and riparian habitat may be possible by manipulation of reservoir water levels.

WILDLIFE

Overview of Existing Conditions

Most of the area consists of relatively open grassland except along the northern section of the dam where a large riparian bosque is well established. Wildlife species typical of grassland and Sierran foothill habitats are expected here. The area of grasslands may have vernal pools. Vernal pools in this area are inhabited by vernal pool fairy shrimp, which are listed as threatened by Federal agencies.

The riparian stand could host California endangered yellow-billed cuckoos, and federally listed (threatened) willow flycatchers. CNDDB only records four species of special concern: vernal pool fairy shrimp, yellow-billed cuckoo, willow flycatcher, and San Joaquin kit fox.

Constraints

CNDDB records do not specifically place any of these species at this site, but they must be considered as potentially present until biological field studies can confirm their presence or absence. The kit fox is most likely present, but would not constitute a large threat to the project as impacts to it can be mitigated.

Opportunities

The relatively flat terrain of this site would allow expansion of riparian habitat if water were retained in it for longer periods. Expansion of riparian habitat would benefit a wide range of wildlife species. If the yellow-billed cuckoo and willow flycatcher are present, additional habitat would likely support additional pairs. If they are not present, additional riparian habitat might create a threshold that would support them. Regardless, an increase of riparian habitat would be a benefit to wildlife.

AQUATIC BIOLOGY/WATER QUALITY

Overview of Existing Conditions

Dry Creek, which would be partially inundated by the reservoir, was dry at the time of the field visit and probably flows only during periods of rain. It has no direct connection to other

waterways and probably contains no significant aquatic biological resources. Water stored in the reservoir would be diverted from the Friant-Kern Canal and would likely be of good quality.

Constraints

Big Dry Creek Reservoir would have no carryover storage because of the flood control function of the dam. Therefore, the reservoir would have no permanent aquatic habitat and it could support only a put-and-take fishery.

Opportunities

Because of the relatively low reservoir elevation and shallow depth, it would be warm and only warm-water species would survive.

RECREATION

Overview of Existing Conditions

The Big Dry Creek flood control area is situated on undeveloped property, owing to its use for flood control. No recreation facilities are situated in the immediate project area. The area is flat and dry, and not conducive to recreation activities. The nearby Friant-Kern Canal is fenced to discourage access.

Constraints

No developed recreation facilities are in the Big Dry Creek flood control area. Furthermore, dispersed use is unlikely. Significant impacts to recreation resources are not expected.

Opportunities

Since the proposed modifications are not expected to result in impacts to recreation, no mitigation would be required. The relatively small size of this reservoir and the limited storage schedule would not likely support development of major recreation facilities. Minor improvements such as nature viewing trails and platforms may be desirable if wildlife is present.

CULTURAL RESOURCES

Overview of Existing Conditions

The Dry Creek and Little Dry Creek drainages were traditional territory of the Gashowu Foothill Yokuts people. The majority of Southern Valley and Foothill Yokuts people now live on the Tule River Indian Reservation, near Porterville, although many Gashowu descendants probably live at Table Mountain Rancheria east of Friant.

Specific information is presently unavailable regarding the archaeology of the Big Dry Creek area. In the state of California, there are over 100 watercourses named Dry Creek, 5 alone

associated with the Upper San Joaquin River Basin Storage Investigation. The proposed Montgomery Dam is on Dry Creek in Merced County. Another Dry Creek is shown just north of the San Joaquin River and Friant Dam in Madera County. The existing Big Dry Creek Dam is on a Dry Creek in Fresno County. Finally, there are two Dry Creeks in the Terminus Dam area of Tulare County, one to the north and one to the south of the Kaweah River downstream of the dam.

Specific information is presently unavailable regarding history of the Big Dry Creek Area. More extensive riparian growth in the past would suggest a moderate probability of prehistoric archaeological sites, including bedrock milling stations and hunting camps in the area. A variety of sites are likely to be present, associated with agriculture and other activities. In May 2002, a probable homestead site was noted north of Dry Creek.

Constraints

At least some cultural resources are likely to be present in the area. Inundation of archaeological sites (prehistoric or historic) can result in loss of important scientific data. Because an existing dam structure would be utilized, however, additional water storage at Big Dry Creek Reservoir would likely cause no adverse effects to sites above and beyond those that may occur from the flood control function of the facilities as presently designed. No properties eligible for the National Register of Historic Places are known to be present. No Native American sacred sites or Traditional Cultural Places are known to occur, but this does not rule out their presence.

Opportunities

Because no adverse effects are anticipated, mitigation opportunities do not pertain to this potential measure.

LAND USE

Overview of Existing Conditions

Most of the land within the reservoir inundation area is used for grazing. There are also several orange groves in the southeastern portion of the reservoir.

Residential development within the immediate vicinity of the existing flood control area is sparse, but growing.

Constraints

No land use constraints are foreseen. The proposed project would involve re-operation of an existing facility so there would be no change in the maximum potential water elevation of the facilities, as designed, and surrounding uses would remain the same.

Opportunities

Although the site is undeveloped and the proposed project would create minimum potential for disruption of an existing community, no specific opportunities for land use development were identified.

MINING AND OTHER PAST ACTIVITIES

Overview of Existing Conditions

There is no evidence of mining or other prior discontinued human activities in the area of the project.

Constraints

No constraints have been identified.

HAZARDOUS AND TOXIC MATERIALS

Overview of Existing Conditions

There is no evidence of former occupations within the reservoir area that could have involved use of hazardous or toxic materials.

Constraints

No constraints have been identified.

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CHAPTER 6. STORAGE STRUCTURES AND APPURTENANT FEATURES

EMBANKMENTS

The existing homogeneous rolled earth fill dam needs to complete the 50 percent fill test to the satisfaction of the DSOD before it is known whether the existing dam structure can accommodate increased water storage. It is anticipated that before the dam and reservoir could be fully used for long-term water storage, extensive modifications and possible reconstruction would be needed. However, the extent of required modifications is presently unknown.

RESERVOIR AREA/ELEVATION/CAPACITY CURVES

Reservoir elevation vs. storage is shown in Figure 6-1. Although reservoir area data are not available at varying elevations and storages, at maximum capacity of 30,100 acre-feet, the surface area of Big Dry Creek Reservoir would be approximately 2,200 acres.

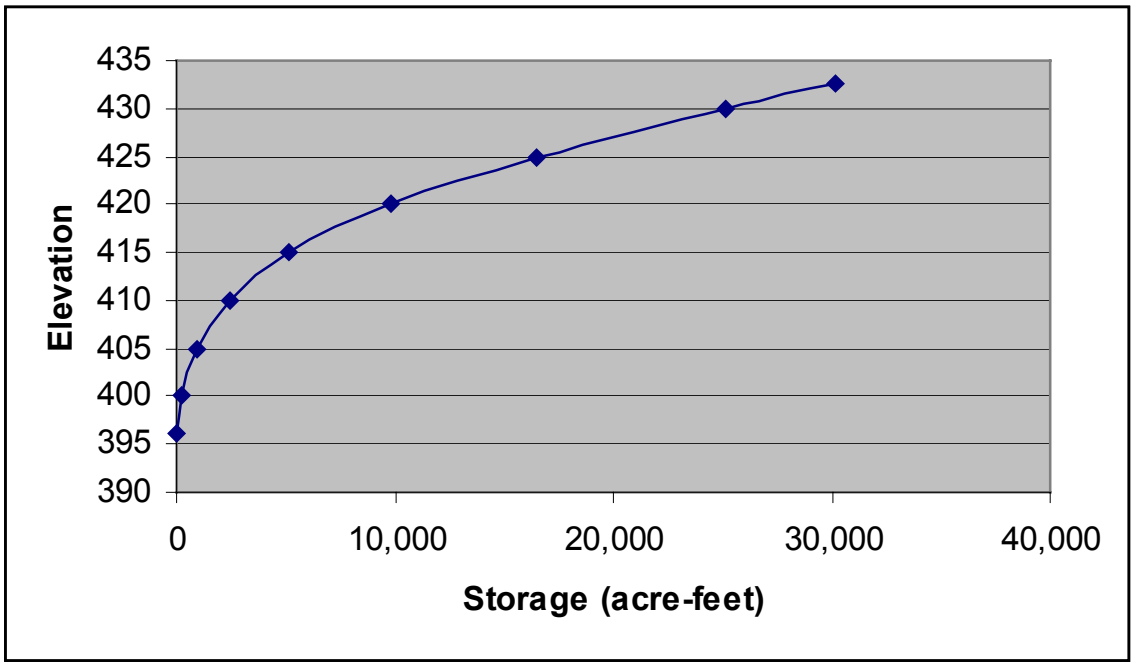

FIGURE 6-1. ELEVATION VS STORAGE CURVE

CONSTRUCTABILITY

Land, Right-of-Way, Access, and Easements

All land and right-of-way within the Big Creek Dam and Reservoir area is owned by the FMFCD and/or the City of Fresno.

Borrow Sources/Materials

Borrow sources and materials are not applicable to this project, since dam reconstruction is not within the scope of the improvements currently under consideration.

Foundations

In exploration of the Big Dry Creek Dam (COE, 1986), underlying soils generally consisted of clayey sand (SC) with lesser amounts of silty sand (SM), sandy clay (CL), sandy silt (ML), and clean sand (SP-SW). Grain-size distributions of the samples were 30 percent fines, 65 percent sand, and 5 percent gravel. Fines ranged from non-plastic to medium plasticity.

Distribution of the materials was random except for a 500-foot wide section of clean sand where the dam intersects Dry Creek. This alluvial creek sand is well graded (SW) and recently deposited.

Power Sources

Nearby electrical power would be available.

Staging and Lay Down Area

Potential staging and lay down areas are located within the reservoir area and immediately downstream of the dam.

Contractor Availability and Resources

The are several local general engineering contractor or regionally based general engineering contractors capable of performing the rock excavation, concrete forming and placement, and other associated construction tasks.

Construction Schedule and Seasonal Constraints

Construction of the proposed turnout would require dewatering a portion of the Friant-Kern Canal near its upper end. Close coordination with Reclamation would be required to complete construction of the turnout during an appropriate period.

Flood Routing During Construction

As the primary work would be planned for the dry season, flood routing would not be needed during construction.

Environmental Impacts During Construction

Environmental impacts during construction could be mitigated with proper planning and implementation of best management practices. Noise and visual impacts could be mitigated by conducting most of the work from the reservoir side of the dam. The access road into the reservoir would need to be restricted to the general public. Air quality issues could be

mitigated by dust control measures. A cultural survey should be conducted to identify and ancestral American Indian or historic artifacts and construction activities would be restricted in those areas. Importing rock from distant quarries would cause traffic impacts, but with proper planning and coordination with Caltrans, the major impacts could be mitigated. Truck traffic, well as the excavation equipment would discharge exhaust to the local air basin. All construction equipment should have spark arresters and fire control equipment should be keep readily accessible during construction. Construction water would have to be controlled as well as provisions made for runoff and erosion control. A spill control plan would be needed to control any construction related fuels, lubricants, and other materials.

Permits

It is probable that federal and non-federal sponsors would be involved in the project. This probably joint sponsorship would complicate the permitting process somewhat as federal projects are not subjected to the same level of permitting that are required for non-federal projects.

Given the probable duality of sponsorship, and potential environmental and cultural impacts identified, at a minimum, the following permits and permitting agencies may become involved:

Permit	Permitting Agency
Permit to Construct	DSOD, Fresno County
Encroachment	Caltrans, Fresno County
Air Quality	CARB, Fresno County
Low/No Threat NPDES	RWQCB
Waste Discharge	RWQCB
Blasting	Fresno County
Stream Bed Alteration	CDFG
Fire/Burn	CDF, Fresno County

In addition, the following agencies could be involved in the review of permit conditions:

- Bureau of Land Management
- State Historic Preservation Office
- Advisory Council on Historic Preservation
- U.S. Fish and Wildlife Service

In obtaining these various permits, several plans would have to be prepared, submitted to the responsible agencies for review and approval. Some of these include:

- Construction Plan and Summary Documents
- Quality Control Inspection Plan
- Highway Notification Plan
- Blasting Plan

- Noise Monitoring Plan
- Water Quality Monitoring Plan
- Noxious Weed Control Plan
- Bat Protection Plan
- Management Plan for Avoidance and Protection of Historic and Cultural Properties
- Storm Water Pollution Prevention Plan
- Spill Prevention/Containment Plan
- Visual Quality Control Plan
- Dust Control and Air Quality Plan

Another important regulatory requirement involves compensation /mitigation for habitat loss. In October 1998, the U.S. Fish and Wildlife Service (FWS) issued their draft Coordination Act Report and Habitat Evaluation Procedure (HEP Analysis). The HEP Analysis delineates how compensation for adversely affected baseline habitat and wildlife conditions is to be determined.

In addition, if power generation is included in a project or is modified for an existing project, the Federal Energy Regulatory Commission (FERC) may become involved in the permitting process.

APPURTENANT FEATURES

CONVEYANCE

A turnout from the Friant-Kern canal would be constructed. Releases from Big Dry Creek Reservoir would flow down the existing conveyance system to detention basins.

Pumping Plants

No pumping plants are required or planned.

COSTS

Initial Construction Costs

The total estimated first cost of the project is $1.1 million. This includes $500,000 for the proposed Friant-Kern Canal turnout with a capacity of 400 cfs. This estimate is based on a 200 cfs turnout from the Friant-Kern Canal proposed for North Kern Water Storage District in a Proposition 13 Grant Application, dated December 2001, submitted to DWR. Additionally an energy dissipater and stream armoring may be needed at an estimated 25 percent of the turnout cost ($125,000). Total field costs represent the estimated cost to construct identified features, plus provisions for unlisted items (15 percent), contingencies (25 percent), and mitigation (5 percent). Total project costs include field costs plus estimated

costs for future analyses and planning documentation, development of designs, and construction management (15 percent). Cost estimate details are contained in Appendix C.

Operations and Maintenance Costs

Operations and maintenance costs were not computed in any of the previous studies of the proposed Big Dry Creek project and have not been prepared for this stage of the Investigation.

SYSTEMS OPERATIONS

Operations of the existing system are discussed briefly in the "Erosion, Runoff, and Recharge" section of Chapter 4. If the proposed modifications were to be implemented, systems operations would be coordinated with the CVP Friant Division to release water from the Friant-Kern Canal into the Big Dry Creek Reservoir area. In turn, the Big Dry Creek Reservoir would be regulated to control inflows from the Friant-Kern Canal and releases to the detention basins downstream of the dam.

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CHAPTER 7. HYDROELECTRIC POWER OPTIONS

PUMPED STORAGE CONSIDERATIONS

Pumped storage is not a viable option for this project.

ADDED HYDROELECTRIC POWER TO EXISTING STRUCTURES

There are no existing water storage or hydroelectric structures on Dry Creek.

NEW HYDROELECTRIC POWER

Hydroelectric power generation is not considered feasible for the dam on Dry Creek.

TRANSMISSION AND DISTRIBUTION

Transmission and distribution systems would not be required for the proposed modifications.

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